IS 11372 (1985): Proforma for purchase specification and technical features for belt drop hammers [PGD 4: Metal Forming Machines]

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UDC 621·974·23 : 658·711·6 (083·2])

IS : 11372 - 1985

(Reaffirmed 2005)

Indian Standard

PROFORMA FOR PURCHASE SPECIFICATION AND TECHNICAL FEATURES FOR BELT DROP HAMMERS

Metal Forming Machines and Tools Sectional Committee, EDC 72; Forging Equipments and Tools Subcommittee, EDC 72 : 3 [Ref : Doc : EDC 72 (4048)]

1. Scope

1.1 Lays down the proforma for the preparation of purchase specification for belt drop hammers. It also gives essential information about the belt drop hammers and their accessories which will enable the users to assess their usefulness and applicability.

1.2 Specifies technical features, like design aspects, safety aspects, installation and commissioning, etc, of belt drop hammers.

2. Proforma

Specification (1)	Reference to Indian Standard (2)	Unit (3)	Actual Value (4)
2.1 *Hammer*			
2.1.1 *Rated size capacity* — Rated size or capacity of a hammer is the maximum weight of the falling body due to free fall (that is, weight of the tup + weight of the upper die + weight of belt + weight of other accessories attached to the tup).		kg	
2.1.2 *Maximum stroke* — Maximum height up to which the tup can be raised before free fall.		mm	
2.1.3 *Shut height* — Distance between the top surface of bottom tool holder to bottom surface of top tool holder, when the hammer is maximum stroke down position.		mm	
2.1.4 *Maximum energy* — Maximum energy, the hammer can develop in its free fall.		kg. m	
2.2 *Geometrical Dimensions*			
2.2.1 *Frames*			
Distance between frames		mm	
2.2.2 *Close die height*			
a) Maximum		mm	
b) Minimum		mm	
2.3 *Tup*			
Size (front to back)		mm	
2.3.1 *Overall dimensions* — Width × breadth × height. (maximum)		mm × mm × mm	
2.3.2 *Material*			

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Gr 5

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Specification (1)	Reference to Indian Standard (2)	Unit (3)	Actual Value (4)
2.4 *Dovetail* : a) Type b) Size		mm	
2.5 *Anvil* : a) Type b) Size **2.5.1** *Material*		mm	
2.6 *Spigot* **2.6.1** *Size* **2.6.2** Type and size of the taper (general recommendation)		mm 1 : 100	
2.7 Type and size of the locating pin hole			
2.8 Type and size of fastening wedge			
2.9 *Guide* **2.9.1** *Type* **2.9.2** *Distance between guides* **2.9.3** *Material*		mm mm	
2.10 *Anvil* Large heavy block of material which supports the hammer and on which the forgings are to be done **2.10.1** *Size* (front to back) **2.10.2** *Weight* (minimum) (that is, 9 kg × per kg.m of blow energy) **2.10.2.1** Single piece (up to 100 tonnes) **2.10.2.2** Two-piece (up to 100 tonnes) **2.10.3** Type and size of foundation bolt assembly **2.10.4** Distance between foundation bolts **2.10.5** Material		mm Tonnes Tonnes mm	

Specification (1)	Reference to Indian Standard (2)	Unit (3)	Actual Value (4)
2.11 *Belt* The flexible link joining the tup for its lift **2.11.1** Type and size of the belt **2.11.2** Material		mm	
2.12 Clearance between tup and tup guide at the bottom of stroke		mm	
2.13 *Foundation Dimensions* **2.13.1** *Height* **2.13.2** *Width* **2.13.3** *Length* Note — The foundation dimensions shall be designed on the basis of load bearing capacity of soil as 16 tonne/m^2.		mm mm mm	
2.14 *Gear Train* **2.14.1** *Gear* **2.14.1.1** Material/hardness **2.14.2** *Pinion* **2.14.2.1** Material/hardness **2.14.3** *Die holder* **2.14.3.1** Material			
2.15 *Electricals* **2.15.1** *Total power* **2.15.2** *Power supply* **2.15.3** *Main motor:* a) Frame size b) Output(s) c) Speed(s) d) Duty	IS : 1231 - 1974	kW r, ph, Hz kW rev/min hp	
2.15.4 *Auxiliary motors:* a) Frame size b) Output(s) c) Speed(s) d) Duty	IS : 1231 - 1974	 kW rev/min hp	

Specification (1)	Reference to Indian Standard (2)	Unit (3)	Actual Value (4)
2.15.5 *Enclosure* The enclosure of the motor shall be of IP-23 or IP-44 with or without fan cooling arrangement	IS : 2147 - 1962		
2.16 *Control (Tup)*: a) Foot pedal b) Hand lever c) Hand rope d) Pneumatic e) Hydro-pneumatic f) Any other			
2.17 *Belt Drive*: a) Suspension type b) Friction type c) Any other			
2.18 *Geometrical Accuracy*			
2.18.1 Flatness of anvil surface measured across diagonals		mm	
2.18.2 Flatness of tup surface measured across diagonals		mm	
2.18.3 Parallelity of anvil surface to tup surface (maximum deviation)		mm	
2.18.4 Parallelity of tup hole to tup movement (maximum deviation)		mm	
2.18.5 *Clearance* Clearance between guide and tup		mm	
2.19 *Painting*	IS : 5 - 1978		
2.20 Total weight of hammer with electricals and standard accessories (approximate)		kg	
2.21 Floor space occupied (length × width × height)		mm × mm × mm	
2.22 Standard accessories (included in the price of the hammer). Details of accessories			
2.23 Special accessories supplied at extra cost. Details of accessories			

Note — While submitting quotation, all the information above with technical literatures shall be furnished by the manufacturers/suppliers.

3. Design

3.1 *Hammer* — The component design of hammer is to take care of the general working conditions and the duty requirements.

Components which are to be designed on the basis of strength shall be designed with minimum safety factor of 6. The component designed on the basis of life shall be designed for minimum life of 40 000 hours.

3.2 *Anvil* — The anvil block bottom shall be fully machined to give good seating on the foundation and to avoid load concentration. Top shall be machined for seating the standards. Suitable provision shall be made for fixing die holder. Spigot guide shall be provided in the anvil block for taking spigot of the standard.

3.3 *Standards* — Standards are to be designed for taking the shock load due to fall of the tup in addition to the load of lifter mechanism. Foot of the standard shall be of larger area to give greater stability.

Resilient joint material shall be provided between anvil block and standard as well as between standard and lifter structure to absorb shock.

3.4 *Lifter Structure* — Lifter structure shall be of fabricated construction either welded or riveted. The structure shall be machined at the bottom to have good seat on the standard. All pads for machinery seating on the top shall be fabricated before the stress relieving and integrally machined. (Welding of machined pad is not recommended.)

3.5 *Guides* — The guides shall be guiding minimum 75 percent of the tup, even in extreme position. Guides shall be reversible type in order to prolong its life.

3.6 *Tup* — Suitable guides shall be machined on either sides and total length of guide shall be minimum 1 : 2 times the distance between the opposite sides.

3.7 *Lifting Belt* — The belt shall be designed for minimum factor of safety of 6. The belt material shall be capable of withstanding the heat encountered in the normal operation.

3.8 *Gear-Train* — The gear shall be fully machined to the accuracy for medium quality in accordance with IS : 4059-1967 'Accuracy requirements for medium quality medium speed gears'. High speed gears and pinions, if used, shall be statically balanced.

3.9 *Drive* — First stage transmission shall be through belt drive to avoid transmission of shock to motor from lifter mechanism. Belts shall be provided with liberal duty factor to take care of shock load and peak load factor.

Suitable flywheel shall be provided in the system to absorb the peak load and keep the peak load effect on the motor within the safe limit. The flywheel shall be balanced.

3.10 *Fasteners* — The fasteners used shall be of suitable class conforming to IS : 1367 (Part 3)-1979 'Technical supply conditions for threaded fasteners : Part 3 Mechanical properties and test methods for bolts, screws and studs with full loadability' and shall be of semi-precision grade.

Fasteners of other suitable quality can also be used.

3.11 *Lubrication* — All bearings and sliding surfaces shall be provided with positive lubrication arrangement. Automatic lubrication is essential if bush bearings are used. Other bearings shall be either provided with automatic or individual lubrication points suitably positioned. Continuous running gears shall be provided with oil bath type lubrication.

3.12 *Slip* — The full load slip of the motor shall not be more than 5 percent. This slip can be achieved by permanently connected resistance in the rotor circuit in case of slip ring motor.

3.12.1 *Torque* — Minimum pull-out torque shall be 25 percent of full load torque.

3.12.2 *Ambient temperature* — Derating for ambient temperature is applicable in the selection of the motor if this is called for as per the service condition and stated in the enquiry. No derating due to temperature is required under normal condition.

3.12.3 *Motor speed* — Motor speed higher than 1 500 rev/mm shall not be used.

3.13 *Die Holder* — Die holder can be either connected to anvil block by dovetail and key or by suitable poppets and screws. In case of poppets, the number of poppets shall be four.

Suitable dovetails are to be provided in the die holders for dies. These dovetails shall be as per manufacturers specification if not specified by the purchaser.

4. Marking — A metal name-plate shall be attached with each equipment furnishing the following information:

a) Name of manufacturer and trade-mark, if any;

b) Description;

c) Type of machine;

d) Machine number or code number; and

e) The words 'Made in India'.

5. Safety Operation and Operator Protection

5.1 *Platform and Hand Rail* — Suitable platform shall be provided at the level of lifter mechanism for maintenance. Size of the platform shall be sufficient for two persons to stand. Minimum width shall be 600 mm. It shall be capable of taking a moving load of 200 kg.

A permanent ladder shall be provided from ground level to the platform.

Platform shall be provided with suitable hand rail. There shall be minimum two rails, the top rail at the height of 1 000 to 1 100 mm from the platform floor and the other one in between the floor and the top rail. The rails shall be of 20 mm N : B tubes *Min*, heavy class conforming to IS : 1161-1979 'Steel tubes for structural purposes (*third revision*)'.

5.2 *Control* — Control cord shall be of hand pulling pull cord system or of servo-control system. Length of stroke shall be adjustable in case of servo-control system. It shall be possible to convert the control from servo-control to manual pull cord system without difficulty. Pull on the cord required shall not be more than 2 kg.

Pull cord shall be provided with positive safety limit to avoid over-travel of tup and hitting the lifter structure. In addition to this, suitable buffers shall be provided below lifter structure to absorb impact in the event of accidental over travel of tup.

5.3 *Electrical Controls* — All control handles, pedals, push buttons shall be placed in convenient position to allow the operator ample room for operation and permit an unrestricted space for operation.

Unless otherwise specified by the purchaser and agreed to by the manufacturer, direct-on-line ac starter conforming to IS : 8544 (Part 1)-1977 ' Motor starter for voltage not exceeding 1 000 V : Part 1 Direct-on-line ac starter' shall be used for motors up to 10 hp. Above 10 hp star-delta starters' or any other suitable type of starters shall be used to avoid excessive starting current.

5.4 *Electrical Protection*

5.4.1 *Overload protection* — Overload protection for motors against overloading shall be provided for each motor by means of thermal overload relay or magnetic overload relay operating the line contactor. Three phase motors shall be protected by overload tripping devices on each phase.

5.4.2 *Short-circuit protection* — This can be in the form of HRC fuses incorporated in the isolating switches. The purchaser shall also provide suitable circuit breaker with instant short-circuit release.

5.4.3 *No Volt Protection* — No volt protection shall be provided for the equipment. It shall be so designed that the machine does not start again by itself when the supply is restored following an interruption in supply. The following protections are considered optional:

a) Single-phasing protection, and

b) Under voltage protection.

5.4.4 *Starter* — Motor starter shall be suitable for starting and accelerating a motor to normal speed, having no 'running' position other than 'full on' position.

All starters shall comply with relevant Indian Standard specitications.

5.5 *Wiring*

5.5.1 *Regulation for cables* — The current carrying capacity of cable shall comply with the relevant Indian Standard specifications.

Consideration shall be given in such factors as the ambient temperature grounding and disposition of the cables, which will influence selection of the cables.

5.5.2 *Cable runs* — All cables shall run without joints from terminal to terminal. Branch connections are permitted only if easily accessible but through covered junction boxes. All cables mounted on the machinery shall run through suitable conduit pipe.

5.6 *Earthing* — All motor frames and other electrical accessories shall be effectively earthed, complying with *Indian Electricity Rules.*

5.7 *Hammer* — Suitable provisions are to be made for the safety of the operator. Mechanical hold up lever is considered essential. Rotating parts like pulleys and belts are to be provided with guards as laid down in IS : 9474-1980 'Specification for principles of mechanical guarding of machinery'.

5.8 *Gear Train* — Gear train shall be properly protected from exposure to atmosphere. This can be done by suitable guards fabricated out of heavy gauge sheet steel. This guard may also act as oil reservoir.

6. Technical Data for Operation, Servicing and Maintenance

6.1 *Instructions and Diagrams*

6.2 *Instructions for Operation*

6.3 *Instructions for Installation*

6.4 *Machine Rating Plate*

6.5 *Data Sheet Stating the Main Characteristics of the Machine*

6.6 *Circuit Diagrams*

6.7 *Directions for Lubrication*

6.8 *Fault Finding Charts*

6.9 *Foundation Diagrams*

6.10 *Spare Parts*

6.10.1 Spare part lists for:

a) Electrical equipments, and

b) Others.

6.10.2 *List of wearing space parts*

6.11 *Recommended Frequency of Inspection and Adjustment and Preventive Maintenance*

7. Installation and Commissioning

7.1 *Delivery Conditions*

7.1.1 *Requirements for erections*

7.1.2 *Division of responsibility for erection*

7.1.3 *Division of responsibility for provision of erection facilities*

7.1.4 *Division of responsibility for commissioning*

7.2 *Testing*

7.2.1 Testing at manufacturer's premises.

7.2.1.1 The hammer shall be fully assembled at manufacturer's site and idle run for at least eight hours. Bearing temperature and other working conditions shall be checked during this time.

7.2.1.2 Critical dimensions and data shall be checked in accordance with data sheet.

7.2.1.3 Operational test shall be carried out with work piece of resilient material after idle run. Pallet can be used on die holder and on tup in place of die for the purpose of testing.

7.2.1.4 Purchasers shall be invited for the final operational test.

7.2.1.5 Any other test required by the purchaser beyond these called for in the relevant standard shall be subjected to mutual agreement between the purchaser and the supplier.

7.3 *Testing at Purchaser's Premises*

7.3.1 After erection but before the connection to main supply the insulation of the electricals shall be tested by suitable instrument and any defect revealed shall be corrected.

7.3.2 Minimum insulation value of 0·5 M ohms shall be obtained when the circuit is tested with the connected apparatus.

7.3.3 Insulation resistance of each wiring circuit exclusive of connected apparatus before operational test.

7.3.4 The hammer shall be run idle for minimum 4 hours after electrical connection before operational test.

7.3.5 Hammer can be tested in operation with suitable work piece after the idle run. Values, such as maximum stroke number of blows per minute, etc, shall be checked.

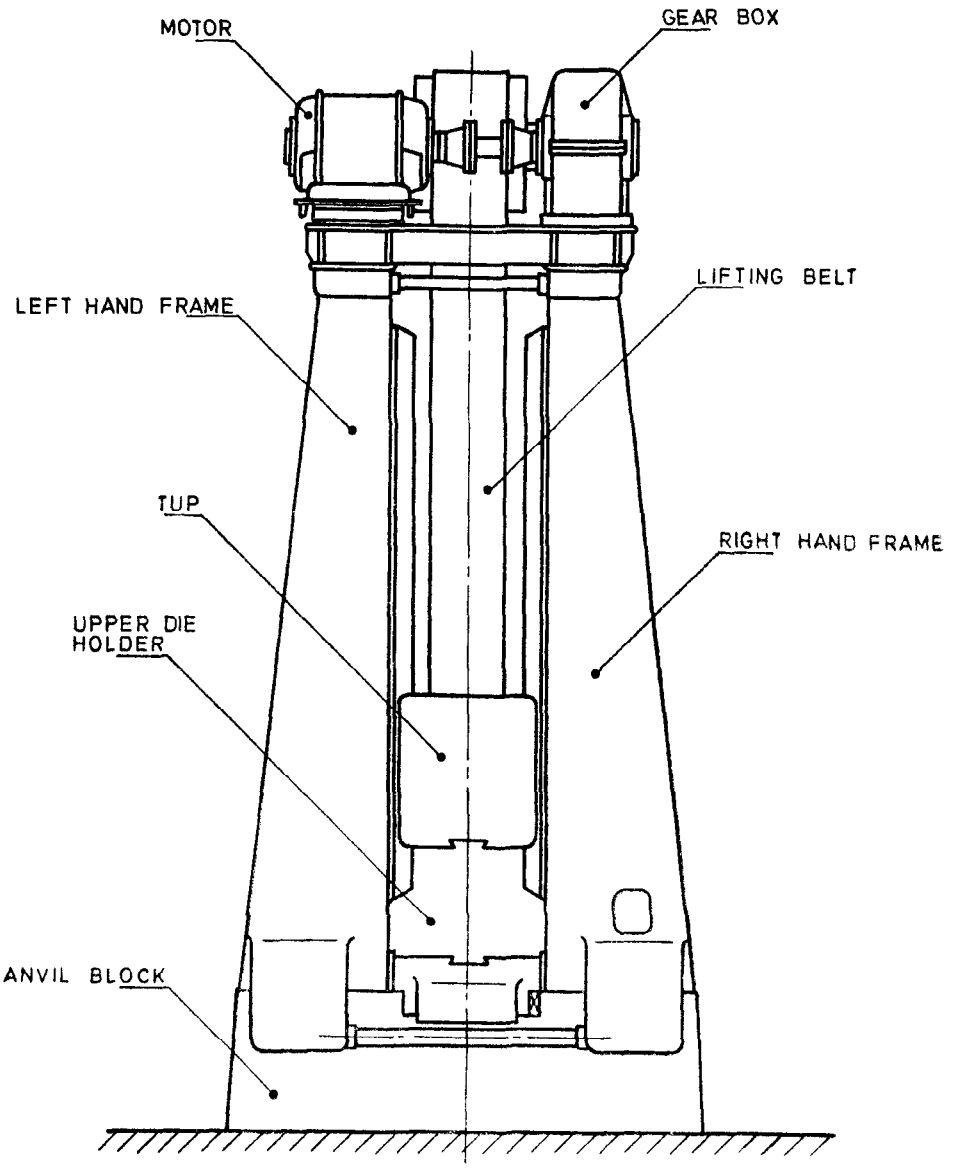
7.3.6 Hammer can be considered as commissioned once the tests are carried out successfully.

Note — Test at purchaser's premises is purchaser's responsibility, unless otherwise agreed.

APPENDIX A

TYPICAL SKETCH FOR BELT DROP HAMMERS

Note — Manufacturer/supplier shall specify the basic information called for in the figure below.



EXPLANATORY NOTE

In preparation of this standard, assistance has been derived from the document 'Form and enquiry, quoting and/or during drop forge plant' issued by Electro Forge Association Standard, England.

This standard has been prepared to enable a prospective buyer to collect data from various manufacturers/suppliers for purposes of comparison before purchasing a belt drop hammer and also to give guidance for testing and commissioning of the same. The proforma contained in the standard is meant to be sent out with an enquiry by the purchaser so that the manufacturers/suppliers can fill in the data and send it back to the purchaser to make comparison easier for the purchaser.

Reference is made to the following Indian Standards in this standard:

IS : 5-1978 Colours for ready mixed paints and enamels (*third revision*)

IS : 1161-1979 Steel tubes for structural purposes (*third revision*)

IS : 1231-1974 Dimensions of three-phase foot-mounted induction motor (*third revision*)

IS : 1367 (Part 3)-1979 Technical supply conditions for threaded steel fasteners : Part 3 Mechanical properties and test methods for bolts, screws and studs with full loadability (*second revision*)

IS : 8544 (Part 1)-1977 Motor starting for voltages not exceeding 1 000 volts : Part 1 Direct-on-line ac starters

IS : 8544 (Part 2)-1977 Motor starting for voltages not exceeding 1 000 volts : Part 2 Star delta starters

IS : 9474-1980 Specification for principles for mechanical guarding of machinery

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(*Page* 5, *clause* **3.10**) — Substitute the following for the existing clause:

"**3.10** The fasteners used shall be of suitable class conforming to IS : 1367 (Part 3) - 1991 'Fasteners — Threaded steel — Technical supply conditions : Part 3 Mechanical properties and test methods for bolts, screws and studs with full loadability (*third revision*)' and shall be of semi-precision grade."

(PE 04)

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